VIII.—*On the Nomenclature of the* Foraminifera.

By W. K. Parker, M. Micr. Soc., and T. R. Jones, F.G.S.

[Continued from vol. v. p. 477.]

32. Orbulites marginalis. Hist. An. s. Vert. ii. p. 196, No. 1. "Recent; European Seas; discovered by M. Sionest on Corallines, Fucus, &c."

Under this name Lamarck placed the living European *Orbitolites*, which, though smaller than the fossil specimens from Grignon (and than the Australian and South Sea individuals), doubtless belong to the same species, *O. complanata*.

33. Orbulites lenticulata. Hist. An. s. Vert. ii. p. 197, No. 3. "O lentiformis, superne convexa, subtus planiuscula. Habite, —se trouve fossile à la Perte du Rhône, près du Fort de l'Ecluse, à huit lieues de Genève. Elle y forme des masses considérables. M. Brard. Mon cabinet."

According to Bronn, this fossil was named *Madreporites lenticularis* by Blumenbach, 1805, Naturhist. Abbild. Nr. u. Fig. 80. It has been recognized by D'Orbigny as a Foraminifer. In his 'Cours Elém.' ii. p. 193, and 'Prodrome,' ii. p. 143, he gives it the generic name of *Orbitolina*, and regards it as "an unsymmetrical *Orbitolites* coated with encrusting cells on one side." This we do not accept as a correct definition of its relationship. Our views of the structure and relationship of this form will be best understood if we trace it from its simplest variety to its highest state of development. It is among both recent and fossil specimens, from many parts of the world, that we collect our materials for the elucidation of this protean and hitherto misunderstood Rhizopod.

1. Among the abundantly varied *Foraminifera* from the Tertiary beds of Grignon we find a very minute, smooth, scale-like shell (about $\frac{1}{100}$ inch in diameter), thin, transparent, and sparsely perforate, and consisting of a circular, subconical, tent-like top covering one or two relatively large subannular chambers, which are not distinctly separate.

Seen from below, these chambers, occupying the greater part of the hollow of the tent or shield, present a convex aspect, with a central pit or umbilicus,—the outer and lower, or marginal, portion of the shield bearing very slight indications of annular septal markings, left probably by the sarcode that occupied the concavity.

Seen from above, or from the side, this little subconical shell presents (by transparency) faint appearances of three whorls of a spire due to the first and second cells (the latter being somewhat semilunar) and the outer rudimentary septum. We name this variety *Orbitolina simplex*.

2. In the Indian seas is a similar little shell (about $\frac{1}{100}$ inch in diameter), which, however, exhibits four narrow curved chambers (each forming nearly three-fourths of a circle), arranged around a central, globular primordial cell, and composing the low cone of the shell and its thin margin. In company with this (which represents a varietal stage in advance of No. 1), we find other specimens (about $\frac{1}{80}$ inch in diameter) possessing as many as ten semiannular chambers. This variety may be termed *Orbitolina semiannularis*.

3. From the Arctic, British, Mediterranean, and other seas we have obtained some specimens of a very small Foraminifer ($\frac{1}{80}$ inch diameter) having the shape of the one last described, and a very similar arrangement of chambers. It has, however, a greater complexity of structure, owing to the presence of numerous secondary septa, transverse and short, in all but the first two or three chambers. These superadded septa begin to appear in a rudimentary form in the third or fourth chamber, on the inside of the peripheral wall; they never reach the umbilical border of the annulus, and are irregular in their development, even in the newest chambers, where they are sometimes thirty or more in number. The base of the shell, or umbilical area, is traversed by raised, sinuous, thread-like lines of shell-matter. In older individuals these are succeeded by thicker and irregularly wavy ridges, and ultimately nearly the whole of the basal surface is masked by this exogenous growth, excepting a thin margin, formed by the newest of the annular chambers, the transverse septal lines of which are also limbate by superadded calcareous matter.

This shell, in its different stages of growth, has been well described and illustrated, under the name of *Patellina corrugata*, by Prof. Williamson (Monograph, p. 46, pl. 3. figs. 86–89); and he notices the difficulty of placing this shell in its true relation to other forms.

Orbitolina (*Patellina*) *corrugata* is present in most sea-beds that are rich with Foraminifers, from the littoral zone down to 500 fathoms; but it does not occur in great abundance.

4. In the shore-sands from Melbourne, Australia, rich with a group of Foraminifers almost the exact counterpart of those of Grignon, we find a small, subconical, finely perforated shell, exceedingly like that last noticed (No. 3), but not unfrequently attaining four times the size ($\frac{1}{20}$ inch). A difference, however, exists. After the primordial chamber, there is usually only one semilunar chamber, those succeeding being annular. The latter are subdivided by short, transverse secondary septa, as in *O. corrugata*; and the cells have a regular alternately concentric arrangement.

The annularity of the chambers in this larger variety is a marked parallel to the concentric cyclical growth of *Orbitolites*, small delicate varieties of which have frequently no annular chambers, whilst the large forms are almost wholly cyclical.

The under surface of this Australian Patelline *Orbitolina* (which we denominate *O. annularis*) is concave, partially occupied by superadded imperfect cells, entangled, as it were, in the exogenous matter, which tends to arrange itself in granules, and more or less obscures the annular structure, which is still, however, apparent towards the margin. The rudimentary cells in the umbilical shell-substance are evidently homologous with those secondary lobes which are formed on the umbilical surface of certain *Rotaliæ*, and which, in certain Asterigerine varieties (such as *Asterigerina lobata*, D'Orb.—a variety of *Rotalia Beccarii*, Linn.), attain a well-marked and symmetrical development.

5. In the white mud of the coral-reefs of Australia, at from 10 to 20 fathoms, there is an abundance of a still larger form, with a diameter of $\frac{1}{10}$ inch and upwards, retaining the same essential characters of structure as the foregoing, but presenting a modification of the secondary chambers, the annular chambers being divided into numerous small vesicular cells. Here the vesicularity gradually masks the annularity of the structure, until, except sometimes in the thinnest specimens, we have a massive little cellular body, sometimes resembling a delicate *Planorbulina*, sometimes losing itself in a low cone of thickly set minute vesicles.

In these specimens the secondary or cross septa of the annular chambers are perfectly developed, compared with the short abortive partitions in *O. corrugata*; and the exogenous umbilical cells of the variety No. 4 (from Melbourne) have been advanced to the condition of cells almost as large and perfect as those of the subdivided annuli. The umbilicus is so far filled up that the base of the cone is almost flat, although generally the last two annular series of chambers may be seen from beneath (as in the case of *O. corrugata*), and a slight concavity remains. This is our variety *O. vesicularis*.

As the subdivisions of the annular chambers lose the cuboidal form and become vesicular, they take on a polygonal shape, being placed alternately concentric. The shell also has the pseudopodial passages relatively larger than in the less-developed forms with flattened feeble cells*. Thus also in delicate conical varieties of *Rotalia Turbo* (such as *R. rosacea*, D'Orb., and *Asterigerina*

* In this state *O. vesicularis* has much resemblance to some of the *Planorbulinæ*; but the latter have two or three tubular and margined apertures to each chamber, they have coarser pseudopodial pores, and no umbilical cells.

Planorbis, D'Orb.) the pseudopodial foramina are extremely small compared with those of larger and more inflated varieties (such as *R. vesicularis*, Lam.).

O. vesicularis seldom preserves its simple single disk of cells; for not only do the umbilical cells increase in number, and become perfect in form, but the upper series have one or more superimposed layers of similar annuli, the primary septa of which are immediately adapted to the earlier septal rings*. These upper or additional layers may or may not extend over the whole area of the first system of rings, being sometimes confined to the centre and heaped up; but sometimes they extend all over, and even beyond, the primary disk. As this growth becomes more perfect in regularity and in the number of its layers, it leads us to the next variety.

6. Accompanying No. 5 are others, differing in shape; some high, like a sugar-loaf, and others subhemispherical. Dr. Carpenter has pointed out to us that in these forms (some of which are $\frac{1}{9}$ inch in diameter) not only is the regularity of arrangement in the overlying annuli well marked, but a vertical section presents several tiers of cells, separated laterally by radial septa, which pass upwards and outwards from the primary cells to the periphery. At the same time, the umbilical cells strive, as it were, to overtake the cyclical series in their growth. They increase in potency, taking on a regularity of arrangement almost equal to that of the upper cells; and the inferior surface of the shell becomes flat, and even convex. The umbilical cells have now an annular arrangement, and, like the others, are placed in tiers, but with shorter radii; for they are still fewer than on the other face, and hence the shell is unsymmetrically biconvex. The primary cells are necessarily subcentral, lying nearest to the umbilical face.

The upper surface now loses almost all trace of the annular structure, from the increasing importance of the polygonal arrangement of the secondary cell-walls. The polygons in No. 5 were elongate somewhat in the direction of the annuli; but now they have become more regular throughout. The upper set of chambers now grows mutually with the umbilical; the two sets being welded together at the edge and growing together. This variety may be termed *O. congesta*; it has passed from the Patelline to the Orbitoline form.

7. We have also from the same coral-mud numerous spherical specimens, differing from the foregoing in shape, but not generally larger (about $\frac{1}{9}$ inch). Their structure is absolutely similar;

* Our attention has been lately drawn to this form of growth by Dr. Carpenter, who has been engaged in researches on some of the larger forms of this group.

the still greater potency of the umbilical system of cells is here the sole cause of variation. Many of the globular specimens have an irregular hole or subcylindrical cavity, bevelled off at the margin, on some part of the surface: this is the remnant of the earlier concavity of the base, the edges of which, growing downwards and inwards, have failed to meet and to make up a perfect globe.

This little spherical *Orbitolina*, which may be termed *O. lævis**, is very common. It occurs also at Fiji, in the West and East Indies, in the Mediterranean, and on the British coast, as far north at least as the Isle of Arran. It is found in the shelly sands of rather shallow water; whilst the little *Orbitolina corrugata*, inhabiting the same seas, lives at a greater depth, on muddy bottoms and in shell-sands. In the fossil state the globular form is found in the Tertiary beds of Palermo, Bordeaux, and San Domingo. The last yields the largest.

8. Among the spherical specimens from the Rewa reefs of Fiji there are some rather flattened individuals (having the same essential structure as those described above, and $\frac{1}{8}$ inch in diameter), which present at their margin one or more small conical or nipple-like processes, composed of cells similar to those of the body, but more compressed. In other specimens these projections are larger and give a lobulate form to the shell, the outline being somewhat like that of an ivy-leaf, and imitating *Calcarina Spengleri*, or *Polystomella unguiculata* with thickened spines. Other individuals have subcylindrical spines which do not always lie on one plane. The length of the spine sometimes exceeds the diameter of the body of the shell. Similar forms occur on the coasts of New Zealand.

Dr. Carpenter has lately shown us that in these spinous and stellate forms the growth of the shell is symmetrical, the two convex surfaces having about equal proportions of the annular tiers of cells. The vertical section in such forms reminds one of the structure of *Orbitoides*, excepting,—1st, that in the latter and flatter Foraminifer the two surfaces of the shell are unequal; 2ndly, the over- and under-lying cells have usually an irregularity of arrangement; and 3rdly, the central cells are small, but numerous, regular, and distinct.

Coexistent with the habit of producing lobes or processes (as holds good also in *Calcarina* and *Polystomella*), we find an increased development of the interlocular or canalicular passages, to the sarcode of which the granulations and overgrowths in other forms are due. Here we find smooth, minute, glossy

* On account of the absence of the roughly limbate septal edges seen in some other varieties.

hemispherical knobs of this exogenous shell-matter quincuncially arranged over the whole surface, three or four cells being included in the area of each quincunx. This style of exogenous growth is also recognizable in some of the spherical lobeless individuals.

The bead-ornament suggests the name *O. sphærulata* for this variety*.

9. A still larger variety of the massive *Orbitolina*, having a sugar-loaf form, a flat or slightly concave base, and a diameter of $\frac{1}{3}$ inch, occurs fossil at Ciply (Belgium), in the uppermost Cretaceous series. It is much mineralized, but appears to have the same structure as the foregoing, including the crystalline knobs on the angles of the septa; but these clear beads are connected together by strings of granules of the same substance, small and variable in size, protruding on the edges of the septa. As a variety, this may be named *O. sphærulolineata*.

10. In the same deposit are somewhat smaller and globular specimens, in which the granular growth of the septal edges is still greater; so that continuous, rough, sinuous walls of division are produced, marking out irregular polygonal spaces, including one or more cells, the faces of which lie low down below the surface. Essentially similar septal projections constitute the limbate feature in *Rotalia Beccarii*, var. *Schrœteriana*, and *R. repanda*, var. *Carocolla*. Similar globular *Orbitolinæ* (*O. globularis*, Phillips, sp.) are common in other Cretaceous deposits.

Millepora? *globularis*, Phillips (Geol. Yorks. pl. 1. f. 12) and Woodward (Geol. Norf. pl. 4. f. 10–12), *Tragos globularis*, Reuss (Böhm. Kreid. p. 78, pl. 20. f. 5), *Coscinopora globularis*, D'Orb. (Prodrom. ii. p. 284) and Morris (Cat. B. Foss. 2nd edit. p. 27), is our *Orbitolina globularis*†. Michelin's *Ceripora Avellana* (Icon. Zooph. p. 208, pl. 52. f. 13), from Sarthe, appears to us to be a large specimen of the same variety. Its probably adherent habit and perforated condition are not inimical to this view.

* Denys de Montfort (Conch. Syst. i. p. 146) has given a curious hybrid picture of his *Triophorus baculatus*, which consists of a three-spined *Orbitolina*, according to its surface-ornament and its vertical section, but outlined apparently after a three-spined *Calcarina Spengleri*, fig. *e*, pl. 15, in Fichtel and Moll's 'Test. Microsc.' The indication of an aperture (the broken newest chamber in *Calcarina*) is also after F. & M. Its sectional aspects appear to have been taken, the *vertical* (Orbitoline) from nature, the *horizontal* (Calcarine) from Fichtel and Moll's fig. *k*, with the sectional feature of the spine (also Calcarine) added from some other source. Some stellate form of *O. sphærulata* may perhaps claim the name of *O. baculata*, Montf.

† The characteristic structure is visible in some specimens preserved in the British Museum, and formerly in the collection of the late John Brown, Esq., of Stanway.

In some of the figured specimens of *O. globularis* the not unusual hole in the base is indicated. Occasionally individuals are perforated by a more or less irregular tubular cavity. The roundness of the specimens, and their holes and tubular cavities, appear to have suggested to the old "flint-folk" of the Valley of the Somme that they might be used for beads; for such perforated *Orbitolinæ* are frequent in the gravel that yields the flint axes.

11. The sinuous superficial mesh-work, formed by the edges of the overgrown septal planes, is a marked feature in the subconical *Orbitolinæ* from the Lower Cretaceous rock of the Perte-du-Rhône (Aptian) and of Sarthe (Cenomanian), from the Greensand of Warminster and Haldon Down, and from the Chalk-marl and Chalk (Turonian and Senonian); also in the little globular fossils of the Chalk known as *Tragos* and *Coscinopora globularis*, varying from the size of shots to that of bullets; and when we find a similar structure apparent in the still larger, irregularly rounded, sponge-like fossils accompanying these globular and conoidal *Orbitolinæ* in the Chalk, we know not how to separate the several forms, where size and some irregularity of shape appear to be the only distinctive characters.

The conical, hemispherical, and flattened forms of *Orbitolina*, so common in the Cretaceous deposits, and known under twelve or more different names, are referable to one specific type, namely the *O. concava*, Lamarck, sp.; and to this type, not only these comparatively large plano-convex and concavo-convex varieties belong, but also the large, limbate, globular forms on one hand, and the small, less limbate, and smooth forms, both round and flattened, recent and fossil, on the other.

Orbitolina concava, Lam. sp., *O. conica*, D'Arch. sp. (Mém. Soc. Géol. France, ii. p. 178), and *O. conoidea*, Gras (Foss. de l'Isère, p. 51, pl. 1. f. 4–6), are concavo-convex individuals, more or less thickened, presenting the typical characteristics of the genus, but neither in too simple nor in too exaggerated a condition. This variety has been figured by Phillips (Geol. Yorks. pl. 1. f. 11), Woodward (Geol. Norf. pl. 4. f. 9), and Mantell (Foss. S. Downs, pl. 16. f. 22–24), and described as a Lunulite. The typical form (*O. concava*) is well figured by Michelin, Icon. Zooph. pl. 7. f. 9.

O. gigantea is a name given by D'Orbigny (Prodrome, ii. p. 279) to a large concavo-convex specimen from Royan, nearly 4 inches in diameter. What a contrast to the little recent *O. annularis* and its congeners!

12. Faujas's "Numismale" or "Lenticulaire" from Maestricht (Hist. Nat. Mont. St. Pierre, p. 186, pl. 34. f. 1–4) is an *Orbitolina*. This, described and figured by Bronn (Leth. Geogn.

3rd edit. vol. ii. pt. 5. p. 94, pl. 29[1]. f. 29) as *Hymenocyclus* * *Faujasii* (*Lycophris Faujasii*, Defr.), consists of a plano-convex disk, about half an inch wide, with a central mamilla on the upper (convex) side. Its vertical section shows two horizontal series of chambers: the upper and largest appear to be the subquadrate subdivisions of the primary annuli (seen also in the horizontal section, which shows four periodical stages of growth around the undivided primordial cells); the lower set may be umbilical cells imbedded in a copious growth of exogenous shell-matter. These characters point it out as a gigantic ally of variety No. 4 above described (*Orbitolina annularis*). It is very closely allied to, if not identical with, *O. lenticularis*, Blumenbach (*O. lenticulata*, Lamarck). This latter is figured by Bronn (Leth. Geogn. 3rd edit. pl. 29[2]. f. 22) after Lamouroux (Polyp. pl. 72. f. 13–16), and presents similar features, though obscured by fossilization and wear. The *O. lenticularis* is from the Aptian beds of the Perte du Rhône; and some specimens are carefully figured and described by Deluc† in the Journ. Phys. lvi. p. 344, figs. 1–6. These are concavo-convex, about $\frac{1}{4}$ inch in diameter, and have a structure almost identical with that of the little recent *O. annularis* from Australia, both as to the smooth upper and radiate lower surface, and as to the "engine-turned" arrangement of the subdivided primary chambers. In the larger and fossil form we appear to have more than one tier or layer of cells. From Deluc's remarks we may conclude that some individuals by their porous surface show a limbation of the septal edges. We cannot separate Deluc's specimens from *O. concava*, on one hand, and *O. annularis* on the other. A short notice and some carefully executed figures of *Orbitolina lenticularis* are to be found in Pictet and Renevier's 'Paléontologie Suisse; Fossiles du Terrain Aptien,' p. 166, pl. 23. figs. 3 *a*–3 *f*.

The *Cyclolina cretacea*, D'Orb. For. Foss. Vien. p. 139, pl. 21. f. 22–25, judging by D'Orbigny's description and figures, is an excessively outspread, thin, discoidal variety, presenting an extreme form of *O. annularis*, of which it is in essential features an exact counterpart, consisting of a series of perfect annuli, with very little development of the umbilical cell-growth. The shell is finely perforate, the perforations being best seen on

* This name is proposed by Bronn to take the place of "Orbitoides," which he rejects as a "hybrid word." D'Archiac, in describing his *Orbitolites media*, expresses his belief that it is the same as Faujas's Numismale. D'Orbigny correctly places D'Archiac's species under *Orbitoides*, and incorrectly includes Faujas's also. Bronn follows D'Orbigny in this, and makes *O. Faujasii* a type for *Hymenocyclus*.

† His fig. 2, however, evidently gives a somewhat mistaken view of the structural details of the vertical section.

the newest or outermost annuli. Bronn, *op. cit.* p. 86, errs in describing the apertures or pores as being on the *edge* of the last chamber. The septa of the annular chambers are limbate; but the secondary or cross septa (though probably present) give no evidence of their existence. This absence of limbation of the secondary septa is such as occurs in certain specimens of *Orbitolites*.

Orbitolina discoidea, Gras (Foss. de l'Isère, p. 52, pl. 1. f. 7–9), is a thick flat form; and possibly *Orbitolites plana* and *O. mamillata*, D'Archiac (Mém. Soc. Géol. France, ii. p. 178), may also be *Orbitolinæ* of the same character. D'Archiac's *Orbitolites media* (*op. cit.* p. 178), placed by D'Archiac and Bronn with *O. Faujasii*, is an *Orbitoides*, as D'Orbigny has indicated. The last, however, mistook *O. Faujasii* for an *Orbitoides*.

D'Orbigny's species *O. radiata* (Prod. ii. p. 280), from Royan, is not well characterized. There are many radiate and stellate Foraminifers in the Maestricht Chalk and the Nummulitic Tertiaries which may be either *Orbitolinæ*, *Orbitoides*, or *Calcarinæ*. The radiate ridging of the surface would not be a feature at variance with the growth and habit of *Orbitolina*. We have not yet, however, sufficient means of comparison to be satisfied as to the relations of the forms referred to, although we believe them to be *Calcarinæ*.

With regard to the relationship of *Orbitolina* to *Orbitoides*, we may say that they have the same structure, as far as the cell-growth and the interstitial substance* are concerned; but *Orbitoides* is always subsymmetrically discoid, or lenticular, heaping cells on both faces of its primary, annular, subdivided chambers; whilst *Orbitolina*, which has one symmetrical variety, has many that have no pretence to bilateral symmetry, any more than the conical *Rotaliæ*, and, in its typical concavo-convex form, it bears the same relation to *Orbitoides* that *Rotalia* does to *Nummulina*. The umbilical growth of irregular and imperfect cells in *Orbitolina* is a feature similar to the astral formation of the divided umbilical lobes of the chambers in some *Rotaliæ* (for instance, *Asterigerina lobata*); and we may say that *Orbitolina* has the same relation to *Rotalia* that *Cycloclypeus* has to *Nummulina*,—Williamson's *Patellina* representing *Heterostegina*.

The following are the most important varieties of *Orbitolina concava*, Lam.:—

1. Orbitolina simplex, *P. & J.* Tertiary: Grignon.
2. —— semiannularis, *P. & J.* Recent: Indian Ocean.

* The limbation, arising from septal granulation, of the stellate *Orbitolinæ* from New Zealand and Fiji, and of the conical specimens from Ciply, is not unlike that of some of the *Orbitoides* of the Maestricht Chalk.

3.	Orbitolina corrugata, *Williamson.*	Recent: British, Arctic, and Mediterranean Seas.
4.	—— annularis, *P. & J.* ..	Recent: Melbourne.
5.	—— vesicularis, *P. & J.* ..	Recent: Australia.
6.	—— congesta, *P. & J.*	Recent: Australia.
7.	—— lævis, *P. & J.*	Tertiary: Bordeaux, St. Domingo, Palermo. Recent: British, Medit., W. & E. Indian, and Pacific Seas.
8.	—— sphærulata, *P. & J.* ..	Recent: Fiji and New Zealand.
9.	—— sphærulolineata, *P. & J.*	Cretaceous: Ciply.
10.	—— globularis, *Phillips*...	Cretaceous: England an Europe. Tertiary: Grignon.
11.	—— concava, *Lamk.* [Type.]	Cretaceous: England and France.
12.	—— lenticularis, *Blumenb*...	Cretaceous: England, France, and Maestricht.

34. Orbulites concava. Hist. An. s. Vert. vol. ii. p. 197, No. 4.

"*O.* uno latere convexa, subantiquata; altero concava. Habite: fossile de la commune de Ballon, département de la Sarthe, à quatre lieues N.-E. du Mans. Communiquée par MM. Menard et Desportes. Sa surface convexe offre souvent des cercles concentriques d'accroissement."

This is the *Orbitolina concava*; it is figured by Michelin, Icon. Zooph. pl. 7. f. 9. We regard it as the type of a species including numerous varieties; see above.

35. Orbulites macropora. Hist. An. s. Vert. ii. p. 197, No. 5.

Lamarck gives no locality for his specimen. Defrance says that *O. macropora* is found at Maestricht. Goldfuss indicates Grignon as the locality for the specimen which he has figured as *Orbitulites macropora*, Lam. (Petref. pl. 12. f. 8). We have not seen such a large-chambered Orbitolite in the Grignon deposits; but we have obtained very fine specimens of the *O. macropora* from the Chalk of Maestricht, whence Faujas, Hafenow, and Bronn also got it. D'Orbigny refers it (under the name of *Cupulites macropora*) to Grignon (Prodrome, ii. p. 397). Galeotti mentions it as occurring at Forêts and St. Gilles (Tertiary), Belgium; and Serres found it in the building-stone of Montpellier (Leth. Geogn. 3rd edit. ii. pt. 5. p. 967).

Bronn unnecessarily distinguishes this form by a generic appellation—*Omphalocyclus macroporus*. At first sight this Orbitolite has distinctive characters, compared with the common varieties of *O. complanata*—such as its small primordial chamber, the strong limbation of the septa, the comparatively thick disk and large chambers, readily worn down so as to resemble pores; but these features are not accompanied by any peculiarity of structure essentially different from the mode of growth of the later and world-wide *O. complanata*.

O. macropora is common in the Bryozoan Chalk of Maestricht, and appears there as the first representative of a genus and species which (with some others, namely *Lagena, Rotalia Turbo, Calcarina Spengleri, Planorbulina Poeyi,* and *Amphistegina vulgaris*), first occurring in that deposit, have continued through the Tertiary period to our own day.

36. Orbulites Pileolus. Hist. An. s. Vert. vol. ii. p. 197, No. 6.

"*O.* uno latere convexa, altero concava; margine sulco exarato. Habite: fossile de .... Mon cabinet. Ses pores ne sont point apparens."

This is probably a thick and conical individual of *Orbitolina concava*. Lamarck gives no locality for his specimen.

37. Orthocera Acicula. Hist. Anim. s. Vert. vol. vii. p. 594, No. 5.

"*O.* testa recta, superne peracuta, subaciculari; striis longitudinalibus rectis. Habite: dans la Méditerranée? Mon cabinet. Coquille très-droite, et remarquable par sa forme aciculée. Sa longueur est de 4 lig. trois quarts."

This delicate, tapering, costated shell will be catalogued as *Nodosaria Raphanus*, Linn., var. *Acicula*, Lam.

"Orthocera" is not required as a generic or subgeneric name for any of the *Nodosariæ*.

38. Nodosaria dentalina. Hist. Anim. s. Vert. vol. vii. p. 596, No. 2.

"*N.* testa elongato-subulata, leviter arcuata; articulis tumidiusculis, glabris. Habite? Mon cabinet. Cette coquille, un peu arquée, et n'offrant qu'un léger renflement dans ses articulations, rappelle en quelque sorte la forme d'une très-petite Dentale. Ayant environs 2 lignes de longueur."

This is evidently the same smooth, delicately acicular, and gently bent variety of *Nodosaria* which was subsequently named *Dentalina communis* by D'Orbigny. *N. dentalina*, however, is a very apt and serviceable name. Besides this well-marked and not uncommon form, there is a host of closely-allied varieties, fossil in many clays and other deposits of Tertiary, Secondary, and even Palæozoic age, and living in the present seas*. *N. dentalina* flourishes on muddy sea-bottoms at a depth of about 100 fathoms; but it extends also in its range from shallow water to 700 or 800 fathoms or more.

39, 40, 41. *Nodosaria Raphanus*, Linn., *Vaginulina Legumen*, Linn., and *Nodosaria Radicula*, Linn., are figured in the Tableau Encyc. et Méth. pl. 465. figs. 2–4, and catalogued in Hist. Anim. s. Vert. vol. vii. pp. 593, 595, & 596; but the figures are bad copies of older engravings (after Plancus), and nothing new is added in the descriptions.

* Ann. Nat. Hist. ser. 3. vol. iv. p. 345.

42–62. The Fichtelian species. Comparing the list of the Foraminifera figured in the Tabl. Encyc. Méth. with those catalogued and briefly described in the Hist. Anim. s. Vert. vol. vii., we find that Lamarck had considered and reconsidered their relations to each other and to the rest of the minute shells which he thought to be microscopic Cephalopods, and that consequently he had laboured to arrange them in a systematic form. That he failed in doing so is not to be wondered at, having no light as to their real relationships. Some of the terms applied by Lamarck to the Fichtelian species and varieties are serviceable, although his notions of the generic groupings were wrong. He did not advance beyond Fichtel and Moll in the definition of the species; indeed at first he retrograded in that respect, giving specific names to several *varieties* of *C. Cassis* in the Tabl. Enc. Méth. In publishing his Hist. Anim. s. Vert., however, he appears to have recognized the propriety of giving wider limits to the specific groups.

63, 64, 65. Nothing need be said of *N. Fascia*, Linn., *N. Raphanistrum*, Linn., and *N. obliqua*, Linn., catalogued in the Hist. An. s. Vert. vol. vii. p. 594.

66. "Nodosaria Siphunculus" is a *Serpula*. See Ann. Nat. Hist. 3 ser. vol. iii. p. 480, where the Linnæan species and varieties of *Nodosaria* are treated of (pp. 477–479).

IX.—*Note on* Carduella cyathiformis. By Professor Allman.

To the Editors of the Annals and Magazine of Natural History.

Gentlemen,

My attention has been directed to a communication "On the *Lucernaria cyathiformis* of Sars," by Mr. Gosse, in last month's Number of the 'Annals.' The following passage occurs in it: "In the 'Quarterly Journal of Microscopical Science' for this month, Professor Allman has described and figured what he considers to be the *Lucernaria cyathiformis* of Sars, instituting for it a new genus, under the name of *Carduella*. I feel sure he was not aware that I had already separated it from *Lucernaria*, under the generic name of *Depastrum*, in the 'Annals' for June 1858, p. 419."

The paragraph here referred to, in which Mr. Gosse institutes his genus *Depastrum*, occurs in his excellent "Synopsis of the British Actiniæ;" and I confess that it had entirely escaped my memory, until the remark above quoted caused me again to refer to the paper which contains it. I find the genus *Depastrum* there defined as follows:—

"*Depastrum* (Gosse). Corpus repente contractum, et supra et